UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/075,721	02/14/2002	Antoine Berthet	28944/38252	1625

			EXAMINER
8968	7590	07/25/2006	TRAN, KHANH C

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ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	**Applicant(s)**
Office Action Summary	10/075,721	BERTHET ET AL.
	Examiner	**Art Unit**	
	Khanh Tran	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 April 2006*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 8-10* is/are rejected.

7)☒ Claim(s) *6,7,11 and 12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02/14/2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some * c)☐ None of:

        1.☒ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____.

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

PTOL-326 (Rev. 7-05)   Office Action Summary   Part of Paper No./Mail Date 20060713

DETAILED ACTION

1. The Amendment filed on 04/28/2006 has been entered. Claims 1-12 are

pending in this Office action.

Response to Arguments

2. Applicant's arguments with respect to claims 1-5 and 810 have been

considered but are moot in view of the new ground(s) of rejection. *See full explanation*

in the claim rejecting below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4, 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Hammons, Jr. et al. U.S. Patent 6,678,263 B1 (previously cited) in view of Bevan

et al. U.S. Patent 6,891,897 B1.

Regarding claim 1, figure 4 illustrates a full-diversity space-time

concatenated encoder in accordance with an embodiment of the present

invention. In column 8 lines 1-35, figure 4 depicts an exemplary concatenated space-time encoder 110 for implementing a full-diversity space-time concatenated coding sequence.

Similar to the transmitter of figure 2, in column 7 lines 15-30, transmit data blocks 52 from the data terminal equipment are segmented and framed 56 into fixed frame length and applied to the mobile's channel space-time encoder 58 at a specified rate. Referring to figure 4, the coding sequence employs an outer code 112, which provides signals to a spatial formatter 114.

Hammons, Jr. et al. does not show a blockwise interleaver in figure 4.

The following discussion would address Applicants' arguments on the issues that because Hammons, Jr. et al. does not use an interleaver between the outer code and inner code, and hence Hammons, Jr. et al. teachings cannot correspond to the outer code of the claimed invention.

The Examiner's position is that Applicants' arguments are not persuasive.

Bevan et al. invention in another US Patent teaches a similar Space-time coding apparatus as shown in figure 5. In column 18 lines 3-15, Bevan et al. teaches an alternative approach to obtaining a code with a large umber of states is to serially concatenate a pair of low-complexity trellis codes. ***Bevan et al. further teaches that it is important to interpose the inner and outer coders with an interleaver of large span.***

Furthermore, in column 35 lines 10-35, Hammons, Jr. et al. suggests that furthermore, the common practice in wireless communications of interleaving

within code words to randomize burst errors. As further shown in figure 1 prior

art, block channel interleaver 20 is employed after convolutional encoder 18 to

randomize burst errors.

In light of the foregoing discussion, Hammons, Jr. et al. and Bevan et al.

teach in the same field of endeavors. Because channel coding and interleaving

provides a measure of protection against corruption of the data during

transmission over an imperfect channel, it would have been obvious for one of

ordinary skill in the art at the time of the invention that Hammons, Jr. et al.

teachings in figure 4 can be modified so that a block channel interleaver 20, as

suggested in Bevan et al. invention, can be implemented after the outer code 112

to randomize the burst errors. A block channel interleaver is necessary due to

fixed length frames generated by a data and segmentation and framing module

56 as shown in figure 2; see also column 7 lines 15-30.

In column 8 lines 1-30, signals from the spatial formatter 114 are

separated for coding at inner codes 116a, 116b and 116c. In view of that, the

spatial formatter 114 demultiplexes the signals for coding at inner codes 116a,

116b and 116c at a specified rate. Furthermore, Hammons, Jr. et al. invention is

directed to the design of space-time codes to achieve full spatial diversity over

fading channels; see column 5 lines 50-60.

Regarding to newly added limitations "said at least one second code

comprising a code of the spatio-temporal trellis coded modulation type".

*In column 8 lines 3-27, Hammons, Jr. et al. further teaches a convolutional encoder applying the binary rank criterion for **QPSK modulated space-time codes** is shown in block diagram form in FIGS. 5a through 5d in which known **trellis space-time codes** proposed for QPSK modulation are shown to comply with the general design rules of the present invention. **Space-time trellis codes** are shown in FIGS. 5a through 5d, respectively, for 4, 8, 16, and 32 states, which achieve full spatial diversity.*

Modulators 118a, 118b, and118c modulates the signals provided by inner codes 116a, 116b and 116c for transmission via antennas 120a, 120b, 120c. In column 8 lines 40-50, Hammons, Jr. et al. further teaches an improvement of *iterative soft-input, soft-output decoding for a space-time channel* is marginalization since the receiver need only access the sum of the transmission from the L transmit antennas. This marginalization is improved via iteration.

In response to Applicants' arguments on page 11 that Hammons, Jr. et al. only considers flat Rayleigh fading channels.

The Examiner's position is that Applicants' arguments are not persuasive for the following reasons. The frequency selective channel as recited in the preamble is the intended use. However, the combination of Hammons, Jr. et al. and Bevan et al. teach all the elements that can perform all the steps as recited in the claimed invention.

Regarding claim 2, in column 8 lines 10-30, Hammons, Jr. et al. discloses in

FIGS. 5a through 5d in which known trellis space-time codes proposed for QPSK

modulation are shown to comply with the design rules of the invention. Space-time

trellis codes are shown in FIGS. 5a through 5d, respectively, for 4, 8, 16, and 32 states,

which achieve full spatial diversity. In light of that, trellis space-time codes can be used

for inner coding at some specified rate.

Regarding claim 3, as recited in claim 2, trellis space-time codes, also distinct

codes of a specified rate, can be used for inner coding.

Regarding claim 4, as recited in claim 2, trellis space-time codes proposed for

QPSK modulation are shown in FIGS. 5a through 5d to comply with the design rules of

Hammons, Jr. et al. invention. Inner codes 116a, 116b and 116c apply trellis space-time

codes to each individual signal to be transmitted via antennas 120a, 120b and 120c.

Regarding claim 8, claim 8 is rejected on the same ground as for claim 1

because of similar scope.

Regarding claim 9, claim 9 is rejected on the same ground as for claim 4

because of similar scope.

4. Claims 5 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elgamal et al. U.S. Patent 6,898,248 B1 (previously cited) and Hammons, Jr. et al. U.S. Patent 6,678,263 B1 (previously cited) in view of admitted prior art on pages 5-6 of the original disclosure (previously cited).

Regarding claim 5, claim 1 discusses the preamble of claim 5, therefore, the preamble is rejected on the same ground as for claim 1. Elgamal et al. teaches a method of symbol transmission employing space-time codes in a multiple antenna wireless communication system, and a method and apparatus for space-time signal processing and multi-user detection and decoding in a multiple antenna wireless communication system; see column 1 lines 20-30. Elgamal et al. invention applies to space-time Trellis coding receiver for spatial diversity. As common knowledge of an average skill in the art at the time of the invention was made, because the receiver performs the reverse process of the transmitter, one of ordinary skill in the art at the time of the invention was made would have been motivated to employ Elgamal et al. receiver to receive the space-time signals transmitted by Hammons, Jr. et al. transmitter.

Referring to figure 4, in column 9 lines 5-45, Elgamal et al. teaches a soft-input/soft-output (SISO) multi-user detector module 44 provides *joint soft-decision estimates of the n streams of data*. Each of the detected streams is decoded by each of the separate SISO channel decoders 48a through 48n associated with the component channel codes. The detected streams are deinterleaved, as indicated at 46, prior to decoding. The output of the decoder is

interleaved again, as indicated at 50a through 50n, to facilitate interleave

processing by the multi-user detector. After each decoding iteration, the soft

outputs from the channel decoders 48a through 48n are used to refine the

processing performed by the SISO multi-user detector.

In light of the foregoing disclosure, the n streams of data are subjected to

an iterative process of jointly decoding. The SISO decoder (see figure 4)

generates a first Extrinsic STS information stream on the bits coded by the first

outer code and interleaved constituting an a priori information item.

Elgamal et al. does not teach the step of equalization of transmission

channel at the receiving side.

Admitted prior art on page 6 of the original disclosure discusses a similar

serially concatenated spatio-temporal trellis coded modulation in which it is

essential advantage consisting in allowing joint equalization and inner spatio-

temporal decoding by virtue of sub-optimal SISO algorithms of reduced

complexity.

Elgamal et al. and admitted prior art teach in the same view of endeavor.

Admitted prior art discusses the essential advantage of joint equalization and

decoding. As further common knowledge of one of ordinary skill in the art,

because an equalizer is necessary to compensate for intersymbol interference

resulting from channel distortion, it would have been obvious for one of ordinary

skill in the art at the time of the invention that that Elgamal et al. receiver can be

modified to implement the step of joint equalization as taught in admitted prior art.

In response to Applicants' arguments on page 13 that even if one might consider adding an equalization step to the decoding process of Elgamal, the presence of the de-interleaver/interleaver would thus impede achievement of a joint equalization and decoding process.

The Examiner's position is that Applicants' arguments are not persuasive. In column 2 lines 10-20, Elgamal et al. explicitly teaches joint [Emphasis Added] detection and decoding algorithms based on the iterative soft-input-soft-output (SISO) approaches. As recited above, Elgamal et al. receiver can be modified to implement the step of joint equalization as taught in admitted prior art.

Deinterleavers 46a-46n (see figure 4) generate second extrinsic information as claimed;

SISO decoders 48a-48n (see figure 4) generate third extrinsic information streams, corresponding to the claimed third extrinsic;

third extrinsic information streams are subjected to bit interleavers 50a-50n for generating extrinsic information stream;

extrinsic information streams are reinjected into the iterative process for equalization of the transmission channel and joint decoding.

Regarding claim 10, claim 10 is rejected on the same ground as for claim 5 because of similar scope.

Allowable Subject Matter

5. Claims 6-7 and 11-12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Tran whose telephone number is 571-272-3007. The examiner can normally be reached on Monday - Friday from 08:00 AM - 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on 571-272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KCT

Khanhcong Tran   07/20/2006

Primary Examiner   KHANH TRAN